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National Energy Strategy

Document becomes platform for debate; Congress reviews related bills; despite war's end, Mideast instability fuels policy momentum

Mark T. Hoske
News Editor

WASHINGTON—"Implementation won't be easy," said President George Bush of the National Energy Strategy (NES), in part perhaps because Congress already has introduced two energy policy bills of its own—in the Senate on Feb. 5 (*EL&P*, 3/91, p.1) and in the House on Feb. 18.

Nonetheless, the President introduced the NES here on Feb. 20, after initiating work on the project in July 1989. Some of his condensed comments on NES follow:

This is a strategy for a secure, efficient and environmentally sound energy future. It's designed to diversify sources, spur competition, increase energy efficiency, offer greater fuel choices, and enhance research and development. This strategy relies on the free market principles, without new energy taxes. It will help expand competition in the electric power business....and promote nuclear technologies of unprecedented safety and reliability. Use of renewable resources could increase 16 percent.

Implementation won't be easy...it will draw on the nation's resources and resourcefulness. The White House will be fully involved to negotiate with congress to put through legislation, while using the powers of the executive branch.

Secretary of Energy James D. Watkins said, in a separate statement, that the overall strategy would cut U.S. demand for oil by 3.4-million barrels per day by 2010, while increasing alternative transportation fuels—including electricity—by the equivalent of 3-million barrels per day by 2010. Watkins, too spurned "command and control measures," such as increased government regulations and taxes. A major element of the NES is increased investment in energy technology R&D, including more than $900 million in FY 1992 (up 34 percent) for investments in support of NES R&D initiatives.

As previously reported in *EL&P*, the 19-month process began with the President's July 26, 1989, request that the Department of Energy develop a comprehensive national energy strategy. Three rounds of 18 public hearings were conducted in 14 cities, with five in or near Washington, DC. Witnesses numbered 448, from 46 states, two U.S. territories and two Canadian provinces. More than 2000 written comments were submitted to DOE directly. A total of 29,000 pages of written material was compiled, DOE said.

White paper workshops, interagency review through the Economic Policy Council and DOE inputs followed, with a modeling effort to create a base case. The Secretary of Energy's Advisory Board helped analyze the first draft. A summary analysis was made public. Final DOE review and refinement preceded submission to the president. The administration made more revisions, with DOE assistance, prior to Feb. 20.

Sen. J. Bennett Johnston (D-LA) and Sen. Malcom Wallop (R-WY) on the Energy and Natural Resources committee introduced energy legislation on Feb. 5, containing some initia-

Continued on page 3

LATE NEWS

President Bush promised to veto energy bills that do not lease some protected Arctic areas (below).
Canada and U.S. signed the Air Quality Accord March 13; Canadian law may tighten; a committee will tackle transboundary issues.
A crippling March 12 ice storm cut power to more than 200,000 Illinois/Indiana customers, some for over a week; see May *EL&P*.
Consumer groups' court challenge delayed CECo's rate hike for five days; the increase would be refunded if overturned (below).
More than 90% of Kansas Power & Light and Kansas Gas & Electric shareholders OK'd the merger. Regulatory votes are pending.
Square D talks with others—perhaps trying to avert French Groupe Schneider S.A.'s $1.98-billion hostile bid—after rejecting an offer. Merger talks failed.
Japan closed a second reactor, seeing Mihama-like flaws, p.17

Three vie for EEI's Edison Medal

WASHINGTON—Three electric utility companies have been nominated for the Edison Award, the highest honor given by the Edison Electric Institute, the trade and lobbying association of the investor-owned electric utility industry.

The three, selected by a special Edison Electric Institute review committee headed by *EL&P* Editor-in-Chief Robert A. Lincicome, are General Public Utilities Corp., Pennsylvania Power & Light Co. and Wisconsin Electric Power Co.

The companies have been invited to prepare and submit documentary presentations covering their cited accomlishments, which will be judged by a panel of independent experts.

Continued on page 8

Ice storm hits New York utilities

Hurricane-like damage, say some crews

A lineman untangles wires from a snapped Rochester Gas & Electric pole

Full story, p. 12

ComEd gets relief, 14% rate increase; consumers oppose

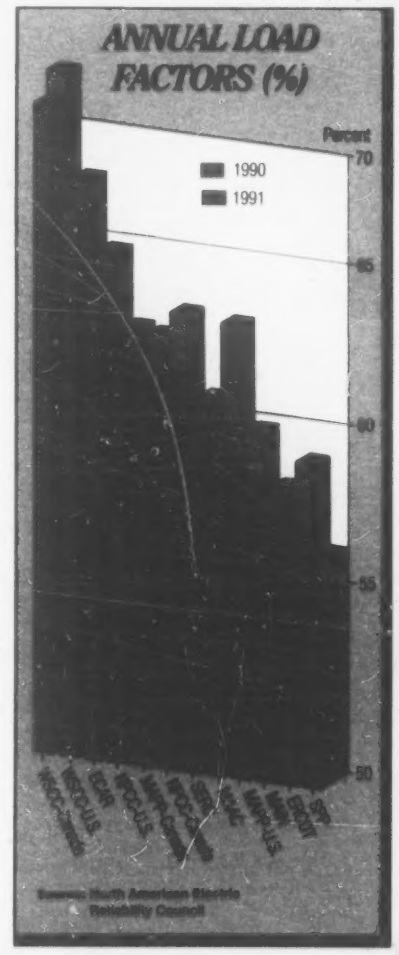
CHICAGO—Illinois regulators granted Commonwealth Edison Co. (CECo) a 14-percent, $750-million rate increase to help pay for three nuclear plants.

The March 8, 6-1 decision was 40-percent smaller than CECo sought and more than ratepayers wanted.

Consumer groups promised litigation to attempt to overturn the decision, saying only one of the three units was needed. The northern-Illinois electric utility sought a 23-percent, $1.23-billion rate hike. On Feb. 7, regulatory hearing examiners recommended a 9.8-percent increase.

The commission disallowed $733.8 million, saying 10.3 percent of the $7.1-billion cost for the three units was not reasonably incurred. However, the ICC agreed with CECo that all three plants are needed, calling them "used and useful." CECo was allowed to recover $1.73 billion of the $2.07 billion in deferred

Continued on page 6



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News Briefs

JILL MINNER, Special Projects Editor

DOE estimates cost of Super Collider

The Superconducting Super Collider project will cost an estimated $8.249 billion, according to a report released to Congress by the Department of Energy. DOE said the project, to be conducted in Ellis County, TX south of Dallas, is scheduled for completion in Fiscal Year 1999.

The Super Collider will be the world's most powerful particle accelerator, a basic research tool to explore the fundamental properties of matter and energy, according to DOE.

Ruling allows CLECO to begin electric service

As a result of a recent Louisiana appellate court ruling, Central Louisiana Electric Co. (CLECO) may provide electric service to the City of Opelousas, LA for 10 years beginning in August 1991.

The city's current electric supplier had filed suit contesting the city's authority to contract with CLECO based on the results of an October 1989 referendum. The court ruled that the referendum results were valid.

Sierra Pacific files amended resource plan

Sierra Pacific Power Co. announced that it has filed amendments affecting the supply side of its Electric Resource Plan with the Nevada Public Service Commission.

In its amendment, the utility requests approval of power contracts it has negotiated with energy suppliers to purchase 107 MW. In addition, Sierra Pacific is seeking to increase efficiency and add to the capacity of its electric system by rebuilding one of its existing hydroelectric plants and interconnecting two existing transmission lines.

The plan was originally approved by the PSC in 1989. Sierra Pacific is expected to file its next Electric Resource Plan in July 1992, according to the utility.

Shareholders tell ACC: accept Palo Verde audit

The Pinnacle West Shareholders Association (PWSA) said it has filed a motion to require the Arizona Corporation Commission (ACC) to accept the results of its $46-million prudence audit of Arizona Public Service's (APS) Palo Verde Nuclear Generating Station, and to adhere to the conditions it had set before the audit was conducted.

According to the PWSA, the ACC agreed to precise standards that would be used to determine whether APS' management decisions and expense outlays were reasonable in building Palo Verde. The ACC also issued an order asserting that the findings of the Ernst & Young audit "would conclusively determine" how much of APS' investment in Palo Verde would be allowed in rate base.

The auditors found that only $50 million of APS' $2.6 billion investment in Palo Verde was spent imprudently, and that was more than offset by $183 million in savings from superior construction management, the PWSA said. The ACC has refused to include the auditors testimony in the APS rate case it is conducting, according to the PWSA.

"We instructed our attorneys to file this motion because it's absolutely wrong for this commission to change the rules they made simply because they don't like the way the audit came out," explained PWSA Chairman Keith Sprinkle.

PacifiCorp/Utah Power savings up after merger

According to PacifiCorp, its merger with Utah Power & Light Co. has resulted in total actual savings for 1990 of $90 million, much higher than the company's original goal of $70 million.

The preliminary breakdown of savings shows: $25 million from power supply; $24 million from manpower efficiencies; $18 million from insurance; and $23 million from other areas, PacifiCorp reported.

NRC extends Pilgrim's operating license

Boston Edison Co.'s Pilgrim Nuclear Power Station has received an extension on its operating license from the Nuclear Regulatory Commission, according to Boston Edison Senior Vice President-Nuclear George W. Davis. The new expiration date for the extension, which was originally requested in 1986, is June 8, 2012.

Supply behind demand for energy-efficient lighting products

It may be two years before the supply of energy-efficient lighting products catches up with the increased demand, according to a report completed for Northeast Utilities by Arthur D. Little, an international management and technology consulting firm.

The report states that due to the industry's increased commitment to energy conservation, demand will continue to grow significantly, probably beyond recent rates. "Manufacturers admit that the huge increase in demand over the last year or two caught them by surprise," the report notes.

Utilities are encouraged to carefully weigh supply and demand before embarking on investment-intensive conservation programs. "In the short term, participation in these conservation programs may suffer because consumers cannot get the [energy-efficient lighting] products," says Marc Rubin, a senior consultant at Arthur D. Little.

AEP joins GEMI

American Electric Power Service Corp. announced that it has joined the Global Environmental Management Initiative (GEMI), a coalition of major corporations formed to foster environmental excellence by businesses worldwide. "We are delighted to welcome AEP to this distinguished group of American companies who are seeking to contribute in a substantive way to improving corporate environmental management," said GEMI Executive Director Susan F. Vogt.

Other U.S. companies that are members of GEMI include: Duke Power, Florida Power & Light, The Southern Company, General Electric, AT&T, Boeing, Dow Chemical, Eastman Kodak, DuPont, IBM, Occidental Petroleum, Proctor & Gamble, Tenneco, Union Carbide and USX Corp.

NRC reviews Kewaunee

Wisconsin Public Service Corp.'s Kewaunee nuclear plant received a slight decline in performance rankings from the Nuclear Regulatory Commission in its Systematic Assessment of Licensee Performance (SALP). Region 3 NRC Administrator A. Bert Davis noted that the "performance decline was primarily due to weaknesses in management oversight of some activities." "Additional management attention appears to be needed to return Kewaunee to its previous exemplary level of performance," Davis added. The plant had received a perfect score in a previous rating, according to WPSC. "This is still a good report card, but not up to the level we would like to see. Our challenge is to get [it] back to the scores of the previous SALP," stated Ken Evers, WPSC manager-nuclear power.

Personnel briefs

Dan Bollom, president of **Wisconsin Public Service Corp.**, has taken over as chief executive officer of the company. Bollom, who will continue as president and chief operating officer, succeeds Linus Stoll who retired Feb. 28.

General Public Utilities Corp. (GPU) appointed Bruce L. Levy president of Energy Initiatives Inc. (EI), the cogeneration development subsidiary of GPU. Levy replaces Philip C. Mezey, who was named chairman of Energy Initiatives.

Jerry L. Maulden was named group president of **Entergy Corp.** and **Entergy Services**, and is responsible for the utility's newly established distribution and customer service organization. In his new position, Maulden also serves as chairman and chief executive officer of **Louisiana Power & Light Co.** and **New Orleans Public Service Inc.** Maulden succeeds James M. Cain who was appointed vice chairman of Entergy.

Public Service Co. of CO resigns from INPO

The Institute of Nuclear Power Operations (INPO) announced that Public Service Co. of Colorado (PSC) has withdrawn its INPO membership. The utility resigned following the permanent shut down of its Fort St. Vrain Nuclear Generating Station in August 1989. In addition, PSC is no longer a member of the National Academy for Nuclear Training, according to INPO.

Utilities fined by NRC

The U.S. Nuclear Regulatory Commission recently proposed the following fines:

Consolidated Edison Co. of New York

A $62,500 fine for alleged violations at the Indian Power Unit 2 Nuclear Generating Station. An NRC investigation found employees deliberately falsified maintenance completion documents after working on a waste gas system.

Georgia Power Co.

A $50,000 civil penalty for alleged violation of NRC security requirements at the Vogtle nuclear power plant. The violation included five instances where safeguards information was unsecured, unprotected or unattended, the NRC said.

Northeast Utilities

A $50,000 civil penalty for two violations of technical specifications at the Millstone 2 nuclear power plant. The violations involved improperly opened valves which could have allowed radioactive contaminants to escape. The problems were corrected and did not result in any risk to the safety of the public.

Virginia Electric and Power Co.

A $50,000 civil penalty for alleged violation of NRC requirements at the Surry nuclear power plant. After testing the service water flow, the NRC found that two recirculation heat exchangers on Unit 1 did not allow for the required flow rate under certain conditions.

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COMMENTARY

Thoughts while listening to rain on the window at 3 a.m.

It's funny what slips out of the darkness and sneaks into mind while you lie awake in the middle of the night.

Oil was what crept into my consciousness first while lying there listening to the rain splashing gently against the glass. More specifically, I started to think of where we might be as a nation if oil were NOT the driving force behind so much of our social, economic, industrial...and military...development in the U.S. (like many developed countries).

Simplistic though it may be, it occurred to me that if we had gotten off the oil standard after the Arab Oil Embargo in 1973-74, we might be a far different nation today. Consider what might have happened if the government had given the automobile industry a 15-yr progressive timetable to raise its fleet efficiencies to 40 mpg, along with a set of penalties and awards to be assessed against each model for its individual performance...with no exceptions, extensions or exclusions. The penalties/rewards per vehicle could have been high enough to capture managements' attentions...perhaps in the range of $100 per mile of difference between actual and target performance.

And to be fair, consumers could have shared penalties and rewards also, by assessing state license fees based on each model's published mileage performances, as verified by an independent testing organization.

What would have happened if oil-burning industrial organizations—including electric utilities—had been given a grace period of 5 or 10 yr in which to change to some other energy source or begin to pay an energy tax of $1 per gallon or more?

I have the feeling we would have a lot of very efficient conventional automobiles. More beneficially, I believe by now we would have a broad selection of high performance electric-, natural gas- and other derived-fuel-powered cars to choose from.

More factories and other businesses would have switched to electricity for its cleanliness, economy and ease of use; or natural gas; or, in some cases, even coal with its handling and cleanup costs.

Had this happened in the decade and a half following the disruption to the flow of Arab oil in 1973, our thirst for oil would have been slaked and our dependence on foreign oil diminished sharply. We probably would have a substantially more electrified nation, one that would be environmentally cleaner. Moreover, we probably would not have gone to war with Iraq, despite the obvious political gains that action provided the administration, or despite the violations to the rights of Kuwaiti people.

But the government—timid legislators, and administrations, at first ineffectual, then refusing to assume responsible energy leadership under the guise of allowing market forces to prevail—looked the other way. Now we are at a time similar to when the Mideast oil flow stopped in 1973. Have we learned the fallacies of remaining on the oil standard? (Electric utilities have applied some lessons.) Must the U.S. relive many of the same mistakes?

Energy policy, another thought in the early morning darkness, clearly follows oil. The National Energy Strategy—as envisioned by President Bush, and others in various bills—has become today's policy pursuit. It may be on its way to reality. There are many points various groups endorse, but other points, those same groups, and others, must oppose.

The biggest problem, it seems to me, is that the President has gotten his proverbial cart before the horse. Normally, you set up specific goals first. Then you figure how best to achieve them. Determine the objective, the end first; then select the strategies most likely to bring those objectives to fruition. Of course NES goals are mentioned in describing why a particular strategy is recommended. But there was no concensus agreement to the goals to begin with, and sometimes the means appear to be more important than the end. Emphasis is too heavy on supply-side rationale and continuance of market forces for direction. Conservation is endorsed, but without the kinds of commitmenis many expected. Environmental enthusiasts find little to cheer.

This National Energy Strategy seems to be an interesting, perhaps even important exercise. But for all the preparation time, effort and money—before administration revision—many had hoped for more...and better.

Robert A. Lincicome, EL&P Editor-in-Chief

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LETTERS

Combating zebra mussels

The January issue of *Electric Light & Power* carried an informative article about zebra mussels (p.39), the freshwater mollusk that has invaded the Great Lakes and that poses significant peril to many [power] plants.

One statement in your article, however, needs correction and clarification. The article states "...bromine-based molluscicides must be neutralized before they are discharged in the water." Nalco's Acti Brom technology is the only bromine-based molluscicide currently approved by the USEPA for use as a preventive strategy in the war against zebra mussels. In many plant cooling-water systems, Acti Brom's use will not require post treatment to remove halogen residuals. Where such a [treatment] is needed, as determined through development of site-specific plans and rulings by state regulators, sodium bisulfite can readily be used to destroy halogen residuals. This activity is not a "neutralization" step and is not required at most locations.

Edward W. Ekis, Jr.
Utility Chemical Group
Nalco Chemical Company
Naperville, IL

Total quality management

As a 30-yr Quality professional, I was very pleased to see your article on Total Quality Management in the December 1990 issue of *EL&P*. It might be of interest to you and your readers that the Energy Division of the American Society for Quality Control identified Total Quality Management as the "Stairway to Success in the '90s" at its annual conference last year. Many utilities, OEMs and AEs shared their experiences with implementimg TQM and quality improvement programs. We expect to hear more on this subject this October at our 18th annual conference, [to be held] in Danvers, MA.

I would suggest that the only weak point in the piece was that the graphics accompanying the article did not do much to clarify the survey results. The use of 3-D graphics in this application presents a confusing and cluttered appearance. For example, in the graphic entitled "Satisfaction Levels," it appears that 100 percent of respondants were dissatisfied with "Quality of Life," 25 percent were satisfied and 62 percent were neutral. A two-dimensional graph for this and the "Levels of Emphasis" would have more correctly visualized the survey results.

Paul M. Velk, CQE
Quality Assurance Manager
Siemens Power Corporation
Bradenton, FL

White LED

In researching your publication, I noticed a press release run in the January 1991 issue. We have received several inquiries as to the validity of our competitor's "white light" and respond with the enclosed retraction copied from the January '91 issue of *EE Product News*.

[The clipping from *EE Product News* stated that its published new product announcement about WhiteLite LEDs made by Ledtronics Inc erroneously said that the LEDs emitted a white light, when in actuality the multi-chip devices emit a pale yellow light that falls between the 565 nm (green) and 635 nm (red) color spectrum.]

The information Ledtronics released is extremely misleading. The reality of a white LED being available is in the future. White LEDs will require at least 10 percent blue light, and a sufficiently bright blue LED with an acceptable life expectancy is not yet available. The first announcement of such a product will undoubtedly come from Hewlett Packard, Stanley or us—but not Ledtronics.

Nancy Bateman
Marketing Communications
Data Display Products
El Segundo, CA

Editors note: Not to argue with Ms Bateman, but the item on the Ledtronics WhiteLite specified that the light was, in fact, in the amber-yellow spectrum between 565 and 635 nm., with an illumination level nearly twice as bright as present amber-yellow LEDs.

EEI publishes industry statistics

WASHINGTON—The Edison Electric Institute has published the *EEI Statistical Yearbook of the Electric Utility Industry/1989* and the *EEI Pocketbook of Electric Utility Industry Statistics/1990*, which is the latter's 36th edition.

The full-size, softcover *Yearbook* is an authoritative source of facts and figures about the industry. It contains national and state statistics on: generating capacity; electric generation and supply; sales, revenues and customers by class of service; energy data; fuel use; financial data; and general economic material. Besides the softcover hardcopy, a floppy disk version is available that contains 89 Lotus 1-2-3 files that can print out as close approximations of the hardcover tables.

Hardcopy price is $40, with member companies getting a 20-percent discount. Floppy price is $45, also with a 20-percent member discount.

The 3½ X 6¾-in. *Pocketbook* contains 1989 data also, but is designed as a quick reference to information about the electric utility industry. The booklet contains details on: capacity and production; capital and finance; sales, revenues and customers; government ownership; and other items. Price is $3 per copy, and members get 20 percent off here, too.

Order copies from: Edison Electric Institute, 701 Pennsylvania Ave., NW, Washington, DC 20004, Attn: Order & Billing; or call 202/508-5424; or fax 202/508-5794.

413 nuclear units operated in 1990

LAGRANGE, IL—Worldwide, 413 reactors operated in '90, while U.S. commercially operated 111, says the American Nuclear Society (ANS).

Operating reactors were: 234 pressurized light-water (PWR) for 200.9 GW, 88 boiling light-water (BWR), 71.7 GW; 39 gas-cooled, 13.5 GW; 29 heavy water, 15.7 GW; 19 graphite-moderated light-water, 14.9 GW; and 4 liquid metal fast breeder, 1.2 GW. ANS publishes a world list of nuclear power plants in its member magazine, *Nuclear News*. The list includes MW, type, percentage construction complete, date of criticality and start, reactor and generator supplier, architect engineer, constructor, units no longer in service, units by nation, and by reactor type.

Investor-owned utility financing declines

ATLANTA—Investor-owned electric utility financing in 1990 was $7.95 billion, 36 percent less than the $12.49 billion in 1989, according to Ebasco Services Inc. In comparison, alternative energy project financing was $1.2 billion for 1990.

See the table for additional figures.

Ebasco's *Analysis of Public Utility Financing* for 1990 reports that total financing of alternative energy projects amounted to $1.2 billion.

By technology, the breakdown was cogeneration, $535 million; wind $154 million; and independent power, $540 million.

Ebasco Services Inc. is an engineering, constructor and consulting firm.

Offerings of Securities by Investor-owned Utilities ($000)

	1990		1989		'89-'90
	Electric	% of Total	Electric	% of Total	% Change
Long Term Debt	7,017,759	88.3	10,994,212	88.0	-36.2
Preferred Stock	715,850	9.0	720,000	5.8	-0.6
Common Stock	216,775	2.7	771,981	6.2	-71.9
Total Financing	7,950,384	100.0	12,486,193	100.0	-36.2
By Type of Sale					
Public	7,619,384	95.8	9,764,193	78.2	-22.0
Private	331,000	4.2	2,722,000	21.8	-87.8
By Purpose of Sale					
New Money	6,170,289	77.6	9,459,443	75.8	-34.8
Refunding	1,780,095	22.4	3,026,750	24.2	-41.2
By Method of Sale					
Competitive	2,005,000	25.2	2,380,000	19.1	-15.8
Negotiated	5,614,384	70.6	7,384,193	59.1	-24.0
Private Sales	331,000	4.2	2,722,000	21.8	-87.8

Source: EBASCO Business Consulting

Two firms integrate emission controls

HOUSTON—NaTec Resources has entered into an agreement with Lodge-Cottrell, the environmental products division of Dresser Industries, to develop and market integrated turnkey emission control systems for the utility and industrial markets.

The systems for removing SO_2 and NO_x will include NaTec's dry sorbent technology and Lodge-Cottrell's electrostatic percipitators and fabric filters.

NaTec also has announced that it has signed an exclusive contract to market advanced flue-gas desulfurization wet scrubber technology from Saarberg-Holter Umwelttechnk (SHU), a German environmental firm.

GNP growth trails electric demand hike

GAITHERSBURG, MD—The relationship between Gross National Product, the U.S. output of goods and services, and electric demand has become more apparent since the mid-1980s, but electric demand has outpaced GNP by 30 percent, according to John R. Siegel, vice president, Bechtel Power Corp.

"Despite slower growth in the economy—GNP was up only 1 percent in 1990—electric demand held up strongly, gaining 2.5 percent," said Siegel, citing the weather-normalized Department of Energy demand figure.

The primary reasons for the relative jump in electric demand, Siegel explained, are falling real electric prices, a contributing manufacturing sector, and technology and environmental factors favoring growing electricity use as a percentage of U.S. energy used. "Each of these trends is forecast to continue through the first half of the 1990s."

"For 1991 DOE (as well as Blue Chip economic forecasters) expect year-over-year GNP to be flat. Despite no economic growth, DOE is forcasting a 1-percent rise in electric demand," he says.

For more discussions of economic outlook, reserve margins, and electricity prices, see May *EL&P*.

NRC tells states of safety concerns about 'incentives'

WASHINGTON—Federal regulators recently told state regulators they're worried about potential safety hazards that nuclear plant performance incentives might create.

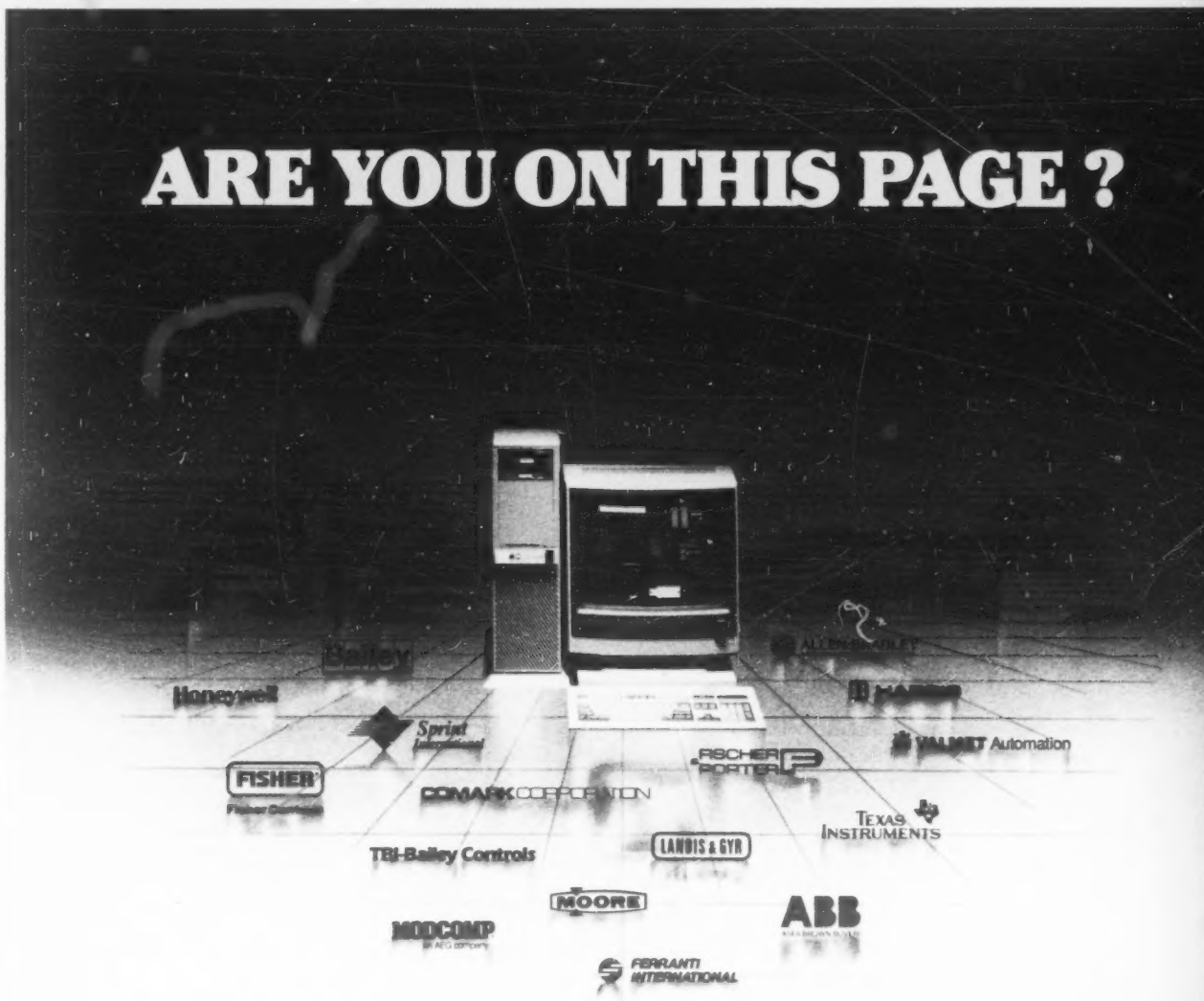
State regulators in 16 states have economic performance incentives intended to promote operation of nuclear power plants and, in some cases, penalize low capacity factors. Sixteen units, and 27 utilities are involved.

May become formal policy

The Nuclear Regulatory Commission discussed a draft policy statement, "Possible Impacts of Economic Performance Incentives," Feb. 27, with members of the National Association of Regulatory Utility Commissioners, at the NRC headquarters building in Rockville, MD.

Regulators called the meeting productive and said they would like to continue the dialogue.

Previous NRC discussions of the issue revealed fears that such incentives could impair safety procedures, an NRC spokesman said. Last year, New Jersey state regulators broadened their nuclear performance standards, making it harder to get penalties and easier to get rewards.



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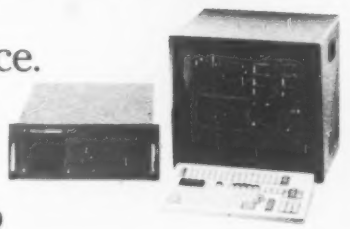

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Inquire R.S. 9

HENRY STEIN, Senior Editor-Generation

Ceramic burner promises to reduce NOx emissions without scrubbers

AUSTIN, TX—The Center for Energy Studies researchers developed a different type of burner that may utilize heat from fuel more efficiently and give off less NOx than an open flame. In the units tested at the Center in the University of Texas at Austin (UT), the flame burns *inside* a porous block of ceramic.

The material is known as reticulated porous ceramic, and it contains large, interconnected pores among zirconia filaments—the pores make up about 80 percent of the volume of the ceramic.

High emissivity

The emissivity of the natural-gas-fueled ceramic burner flame is higher than that of "free" flame because an open flame is a poor radiator of heat. Therefore, the ceramic system will probably compete with radiant furnaces, rather than with mainly convective ones.

What it is, how it works

Each burner prototype is made up of a ceramic block surrounded by insulation, sensors to measure gas temperature and composition, a gas supply tank, a unit to control gas flow, and a computer for data acquisition. A working furnace will substitute heat exchangers for the insulation.

Before entering the block, the natural gas mixes with air in a controlled ratio and is preheated. When the fuel-air mixture reaches the connected pores and passageways in the block, it ignites and burns.

The energy from the gas flame heats the porous block around it. Then the block, not the flame, radiates the heat. In effect, the ceramic transforms the high-temperature flame into concentrated radiant heat.

Some advantages

In the experiments so far, the ceramic block burner achieved higher flame temperatures and remained lit with 30-percent less fuel than an ordinary flame requires. Thus the ceramic burner can burn a lean fuel-air mixture and use poor fuels such as refinery waste gas and gases containing water.

Better flame control also is claimed. Explains Ronald Matthews, engineering professor at UT, "In conventional burner design, you can try to control [residence] time and temperature using fluid mechanics, with limited results." He says, "In this burner, you control time and temperature by controlling properties or the solids, and it appears [to be] very easy."

Matthews adds, "The free flames in power plant boilers are tens or hundreds of feet long in order to get enough radiant output." But a porous ceramic burner can supply "a really high radiant output in a very small combustor."

The flame in this unit burns inside a ceramic block. Its emissivity is about 10 times that of an equivalent open flame.

John R. Howell, director of the center and one of the people to conceive the burner, says the emissivity increase over open flame is about tenfold.

Lower NOx

Hearing of the research, Radian Inc. funded part of the burner development and applied with UT for a U.S. patent on a low-NOx version that is staged. Combustion in this model takes place in two or more steps.

Under some operating conditions, the single-stage porous ceramic burner gives off less NOx than an open flame. With staged combustion, the researchers found they could reduce NOx emissions even further.

The two-stage burner is designed so that the fuel mixture in the first stage is hot but not sufficiently oxygenated to form much NOx, and in the second the mixture is oxygenated but not sufficiently hot.

The first two-stage burner tested out with NOx emission levels below 30 ppm. If the device can be scaled up successfully, it may eliminate the need for expensive emission-control devices such as scrubbers.

The coinventors of the low-NOx burner are Ron Bell, Radian program manager, and four members of the UT faculty—Howell, Matthews, Steven Nichols and William Gardiner.

They may test other burner block materials besides the zirconium oxide, and may also look into different block sizes and geometries.

Gas turbine usage grows

WASHINGTON—U.S. electric utilities increased their generation with gas turbine power plants in 1989 by 31 percent, from 19.1 TWh in '88 to 25.1 TWh in '89.

Operations, maintenance and fuel expenses rose correspondingly by 28 percent, from $833 million to $1.07 billion. According to the report from the Utility Data Institute, a private information services company, gas turbine generation became about twice as expensive on a dollar-per-megawatthour basis as electricity produced from coal or nuclear energy.

"Nationwide," said Liz Hannon, UDI president, "gas turbine and combustion turbine power plants annually produce about 1 percent of all electricity generated by electric utility power plants." However, she explained, while utility construction of new central station plants had "slowed to a crawl," utility orders for new gas turbine peaking plants increased significantly.

The data was based on 463 gas turbine and combined cycle plants operating in 1989, which the company estimated represented approximately 90 percent of the electricity generated by utility owned plants of these types.

Total operating capacity of the 463 power plants was 50.4 GW, an increase

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Cogen plant up and dedicated

BARRINGTON, IL—The 96-MW A.C.E. Cogeneration Project was dedicated Jan. 17 in Trona, CA, after beginning commercial operation on Nov. 2, 1990. Up to 96 MW of electrical output is sold to Southern California Edison Co., and up to 910,000 pph of steam goes to North American Chemical Co.'s Argus plant.

Claimed to be the largest coal-burning plant in the state, it is also called the

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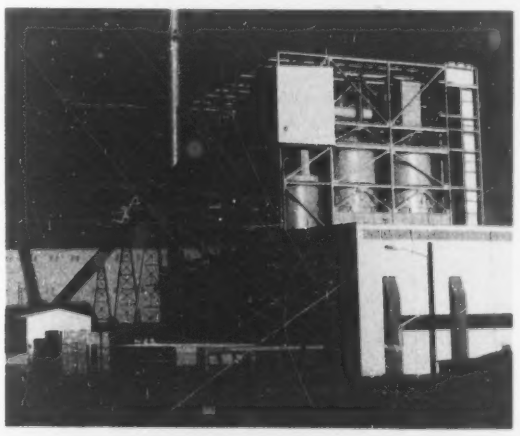

A.C.E. cogeneration plant is said to be the largest coal-fired electrical generating plant in California.

Accident followon

Kansai cleans up Mihama

BARRINGTON, IL—Work is proceeding to repair any damage and to clean up after the Feb. 9 incident at Kansai Electric Power Co.'s Mihama-2 plant in western Japan that released radioactive substances into the atmosphere (*EL&P*, 3/90, p.1, article and Late News).

Primary cooling water was drained from the 250-MW reactor cooling system on Feb. 11-12. At the same time, a leak between the primary and secondary sides was confirmed because the water level on the secondary side also dropped, to just above the half-way point.

Two television cameras were placed inside the steam generator chambers of both hot and cold sides as water was pumped into the secondary side. A leak in a ruptured tube was spotted by the cold-side camera. The failed tube was temporarily plugged, and another leak test was performed. A second leak then was ruled out.

The failed tube had been sound before the incident and had not needed any repairs previously.

Then the secondary cooling water was drained completely. A fiberoptic scope was inserted inside the damaged tube from both the hot and cold sides. In the next step, the tube will be removed and examined.

Kansai Electric stressed that although 20 tons of water had leaked from the primary to the secondary sides, most remained contained within the secondary side until drained. The drained water is in storage until it can be safely disposed of, according to Kansai.

Radioactive noble gas did escape, but the utility estimated only 0.134 curies went into the atmosphere, which is lower than its annual allowance and 8 percent of last year's normal-operation releases.

Confirming the company's assessment, the Fukui Prefectural Government and the International Trade & Industry Ministry, the national nuclear authority, declared on Feb. 12 there was no effect on the environment.

However, the country's nuclear plant guidelines were changed due to the accident to require immediate shutdown when abnormal radiation increases by 20 percent or more.

Where to find engineering info

NEW YORK—This desktop reference work for engineers explains how to solve a variety of technical problems. The *McGraw-Hill Handbook of Essential Engineering Information and Data* is filled with technical information, design methods and data for almost all engineering fields.

Practical in approach, the handbook was assembled by Ejup N. Ganic, Editor-in-Chief, and Tyler G. Hicks, Editor. It contains scores of tables, formulas, charts, diagrams and problem solutions in disciplines such as mechanical, civil, electrical, nuclear and metallurgical engineering.

Hardcover, the handbook has 1072 pages and costs $89.50.

Order from: McGraw-Hill Publishing Co., 11 W. 19th St., New York, NY 10011.

Fifth CFB shows its stuff

SAN FRANCISCO—When the circulating fluidized-bed (CFB) combustion plant near Pittsburg, CA, was synchronized with Pacific Gas & Electric's grid in December, it marked the completion of the five-plant project.

The five San Francisco Bay-area plants generate electricity cleanly and efficiently by burning fluid petroleum coke, a solid fuel byproduct of oil refinery production.

Said Frank Walton, president of Combustion Power Co., the firm that developed the particular CFB process used, "They are the first plants in the country to fire 100-percent fluid petroleum coke." The "fuel" previously was considered a waste product and disposed of as such.

Most of the combustion is confined to the fluidized bed, which operates at 1625°F. This results in 99+ percent combustion efficiency and reductions of SO_2 and NOx emissions greater than 95 percent. The combustion meets or surpasses the nation's strictest air-quality standards and is well below the standards in the new Clean Air Act Amendments.

Walton declares, "In light of the recent cataclysmic events in the Middle East, there is a desperate need for dependable, clean-burning technology to enable the U.S. to utilize alternative fuel sources." The five plants eliminate the need to import more than 1.4-million bbl of crude oil a year.

Then he adds, "The FI CIRC system can fire a wide range of solid fuels, such as petroleum coke, regular coal, coal fines, high-sulfur coal, wood waste and waste coal, in an economical and environmentally safe manner."

The fifth and newest 18.7-MW plant (same size as the previous four), like its predecessors, was developed by GWF power Systems Inc. using FI CIRC technology from Combustion Power Co.

Inside the combustion chamber of the power plant, two technicians prepare for firing the unit up to its 1650°F operating temperature.

PSI hydro unit gets overhaul

MILWAUKEE—A major overhaul of equipment was completed in mid-December 1990 at the Markland Hydro Station of Public Service Co. of Indiana. A-C Equipment Services reworked one of the three generators and Kaplan turbines, the turbine's wicket gates, and the turbine bearing guide.

Although minor maintenance is performed every three years, this was the first time since the hydro plant began operations in 1967 on the Ohio River that a unit has had a major overhaul. The work included disassembly of major components of the 27-MW generator and 41,500-hp turbine, including removal of the turbine runner assembly.

The project required a six-month outage of the units involved.

Preventive maintenance testing was performed on the stator winding and rotating field of the generator. The turbine was completely disassembled for its major overhaul. Extensive cavitation repairs were performed on the three blades of the Kaplan runner. A turbine guide bearing was rebabbited.

The turbine wicket gates were sent to the contractor's factory for repairs to the gate stems and for cavitation repairs to the blade body.

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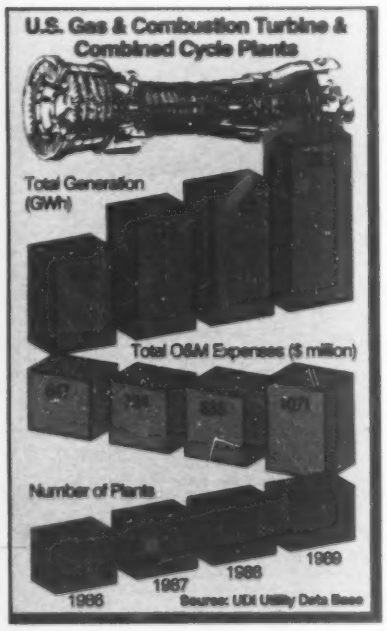
Gas turbines...

of about 4 percent in installed capacity. Capacity is broken down in the report by regions of the North American Electric Reliability Council.

Utilities spent $1.07 billion to operate and maintain the 418 plants for which both '88 and '89 production cost and generation data were available. This was a 29-percent increase. Most of this money went for fuel purchases.

For a copy of 1989 Production Costs - U.S. Gas Turbine and Combined-Cycle Power Plants, UDI-023A-90, *send $225 to: Utility Data Institute, 1700 K St., NW, Suite 400, Washington, DC 20006; or call 800/486-3660.*



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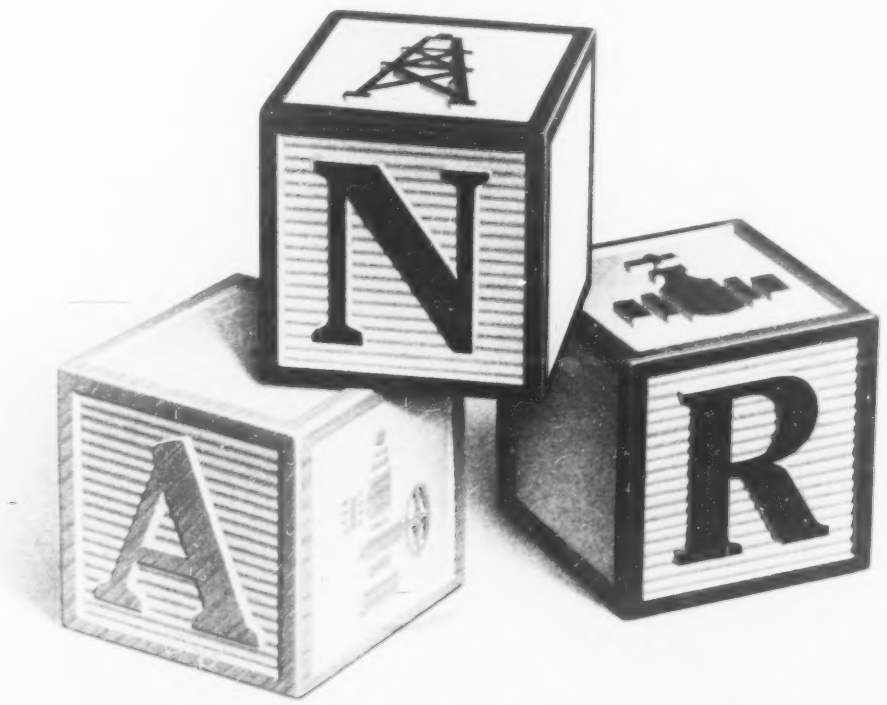

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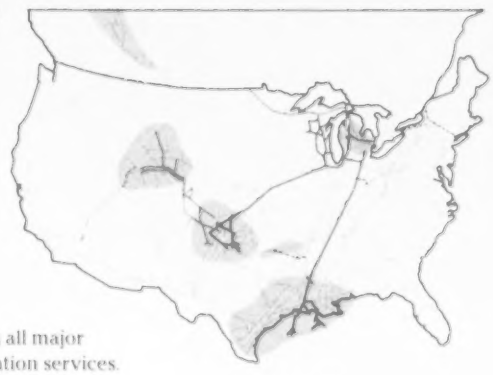

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